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Apparatus & Method for Utilizing Electromagnetic Acoustic Transducers to Non-Destructively Analyze In-Service Conductive Materials

Identifies damage to an in-service conductor associated with the delivery of electric power

Description

Provides data on the integrity of electrical conductivity and mechanical connectivity of the electric power delivery infrastructure by using electromagnetic acoustic transducers (EMATs). EMATs also provide a means for generating and detecting ultrasound in metals during fabrication without touching rolled sheets. The technique can measure key features of magnetostriction, the change in length of a ferromagnetic material that accompanies a change in magnetization. Further development may allow EMAT measures of magnetostriction in situations where it is not practical to attach strain gages, such as with fragile thin films or hot plates. It also may be used to monitor microstructural changes in steel.

Applications

- **Electric power transmission and distribution**
  Non-destructive, in-service inspection
- **Manufacturing conductive metals**
  On-line testing of metals during the rolling manufacturing process

Advantages

- **Non-destructive**
  Ultrasound measurement, no sampling needed
- **In situ analysis**
  Probing sensor may be used with an in-service conductor without disconnecting or excavating conductors; may be used during the manufacturing rolling process for conductive sheet metals

Abstract

The method of the invention identifies damage to an in-service conductor associated with the delivery (transmission and distribution) of electric power. Electro-magnetic acoustic energy is generated in an in-service conductor associated with the delivery of electric power. Corresponding return electro-magnetic acoustic energy is then measured. Features are then extracted from the return electro-magnetic acoustic energy to characterize damage to the in-service conductor. The features may be extracted through a variety of signal processing techniques, such as wavelet signal processing. The extracted features may be classified using a neural network, fuzzy logic, or a combination of both.

Inventors

- Alers, George A.
- Chenoweth, M. T.
- Shoureshi, Rahmat A.

References

- U.S. Patent # 6,382,029 issued 05-07-2002 , expires 03/07/2020
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Status of Availability

This invention is available for exclusive or non-exclusive commercialization licensing. Collaborative research opportunities are available.

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